

The AVI Power® Project for Poultry Farm



AVI Power®

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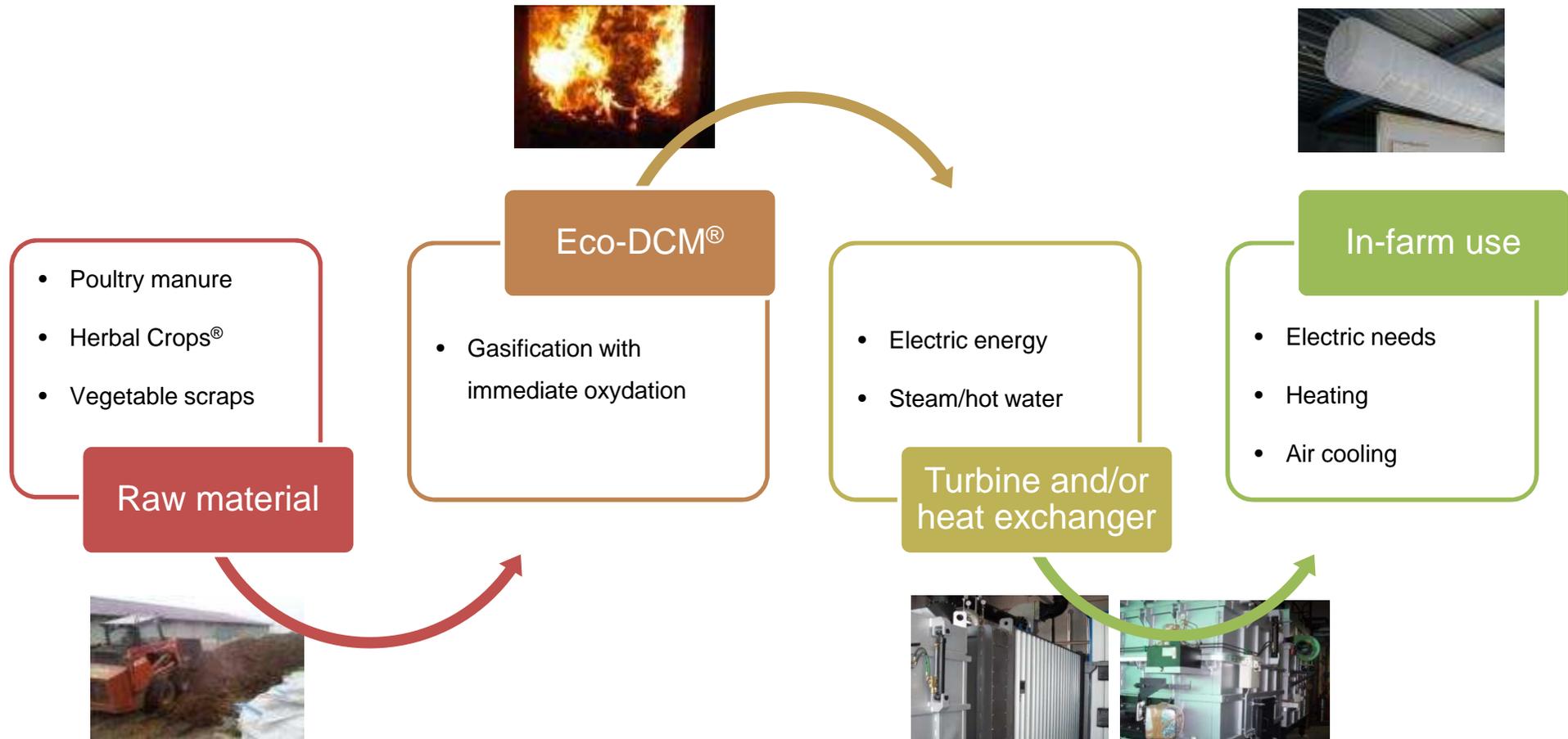
 EcoVal
ENERGIA E INNOVAZIONE

The AVI Power® project

- AVI Power® is a specific project developed for energy production out of exhaust poultry farm bedding, usually considered a problematic waste to dispose.
- The proposed protocol gives the possibility to use poultry manure, alone or in combination with other materials, for the production of thermal and/or electrical power to use within or outside the farm.
- With AVI Power®, poultry manure is no longer a problem but becomes a new environmentally sustainable resource for the farm.



Il processo AVI Power[®]



Why EcoVal

- EcoVal offers complete engineering, installation, testing and commissioning services.
- EcoVal engineering team has over 30 years of experience in renewable energy projects.
- EcoVal obtained authorizations in excess of 200 MWe.
- EcoVal's Eco-DCM[®] combustion system is designed for the specific characteristics and needs of the Client, sizing the plant on quality and quantity of available biomass.
- EcoVal guarantees plant performance to ensure Customer's investment payback.



Why AVI Power®

➤ Use of poultry bedding (manure) as fuel: solution to disposal problem.

- Less costs and bureaucratic problems for the farm.
- Solution of health problems (avian flu), due to quick disposal.



➤ Production of electric or thermal energy: used in farm systems to improve living conditions of animals.

- Quality farming, higher ethical and livestock standards.
- Increased profit for the farmer: higher growth and less mortality.
- Energy independence of the business.



➤ Recovery of renewable source: poultry bedding assimilated to biomass.

- Possibility of economic incentives for energy use.
- Technology forefront of business cycle.



Microclimatic needs of breeding farms

- Poultry are particularly sensitive to climatic conditions in which they live in terms of temperature, humidity and air circulation.
- Present farming systems, which imply the presence of a substantial number of animals in closed and limited spaces, may be subject to problems related to the non optimal management of microclimatic conditions.
- These problems can also result in significant losses of production and a slowdown of breeding cycles.



Microclimatic needs of breeding farms

- Control of ambient temperature;
- Elimination of the excess water vapour;
- Oxygen renewal;
- Removal of carbon dioxide and ammonia gases which are formed by the fermentation of organic bedding.

Type of animal	Temperature (°C)	Relative Humidity (%)	Air Velocity (m/s)	Specific Ventilation Flow (m ³ /h per animal)	
				Winter	Summer
1 day old chicks	35	70	0,17	-	-
3 weeks old chicks	28	70	0,25	0,2	2
5 weeks old chickens	24	60-70	0,5	0,4-0,5	4-5
7 weeks old chickens	18-20	60-70	2,0	0,4-0,5	4-5
12 weeks old pullets	17	60	2,0	1	8-10
adult laying hens	13	45-70	3,3-5,0	1	8-10

Heating

Ambient heating can be done by means of:

- production of hot water used with radiant panels and piping;
- heaters evenly mounted in the premises to be heated/cooled;
- production of hot air;
- heat recovery (air/air heat exchangers);
- infrared or radiant tube radiators.

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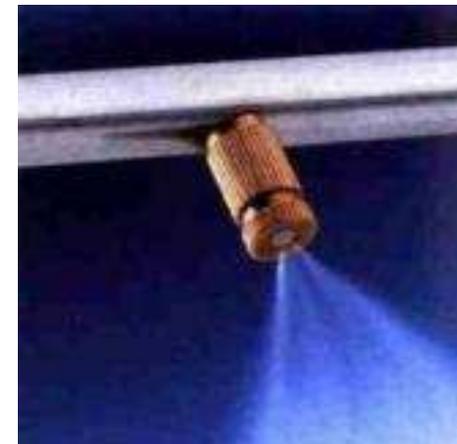


Cooling

Environment cooling can be done with a suitable passive protection of the building, together with:

- evaporative cooling, by air humidification, humidification panels or mist;
- spraying animals with water;
- refrigeration of the air, by means of heat absorption pumps.

— AVI Power®



The poultry bedding problem

Bedding management represents the main poultry farming problem from an environmental point of view, because:

- storage of such material may result in development of unpleasant slurry pollutants and odors, in addition to the spread of animal's diseases;
- poultry bedding contains high amounts of nitrogen: If spread on ground this involves the possibility of soil and aquifer underlying pollution;
- the amount generated from the herd are remarkable, making it difficult to expand the operations of the farms, because of the land needed for spreading.

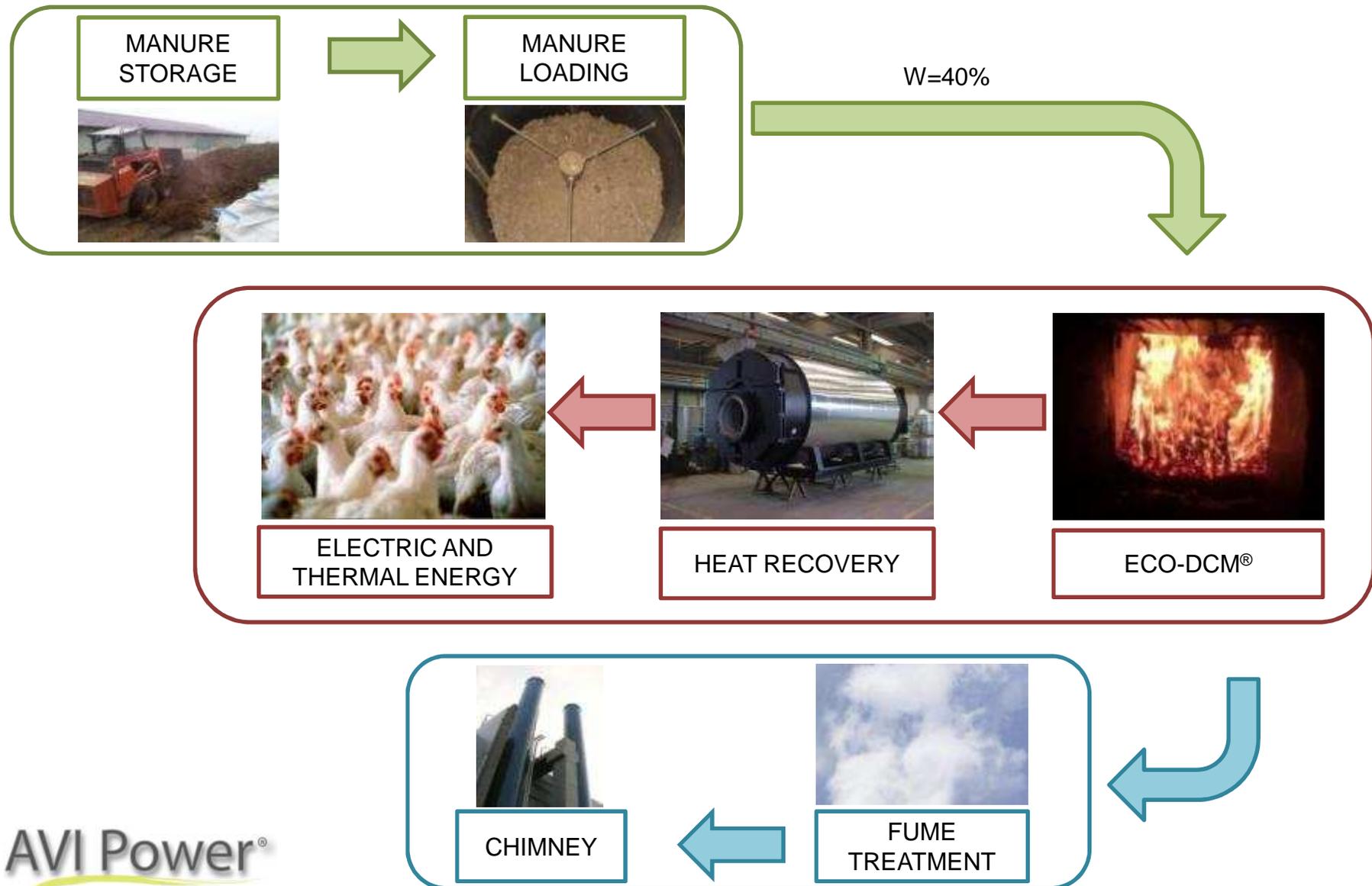


The poultry bedding problem

- Poultry manure is composed of bedding (shavings, peat, rice husk and/or straws) combined with manure and must be disposed of in accordance with regulations (EU Environment Legislation).
- Current techniques require disposal or transfer to specialized companies, with significant economic burden, or the use of manure as fertilizer.
- In both cases the poultry breeder is facing technical difficulties and costs (availability of land for spreading manure, moisture testing and achievement of correct moisture levels for delivery to disposal company, etc.).



The technological line for cogeneration



The fuel

In addition to poultry bedding, other types of biomasses can be used to supply the plant, including:

- dedicated energy crop - Herbal Crops® or other dedicated crops;
- agricultural processing waste, pruning and mowing;
- wood chips.

The use of a fuel mixture allows to lower the humidity and obtain a more stable fuel. In this way it is also possible to exploit marginal lands for the cultivation of energy crops used in the farm.



Herbal Crops®

- Herbal Crops® is a dedicated crop for energy development.
- Annual crop, rationally inserted in cultivation as a spring planting: specific variety for the production of fiber, high size, late cycle, pannicula sparsa type.
- Possibility to easily implement the cultivation making use of machinery already on the farm.
- Herbal Crops® allows to produce high yields even in difficult conditions and with low input of nutrients.
- Harvesting can be performed by cutting, tearing, windrowing or shred the biomass and storing it in normal horizontal silos.

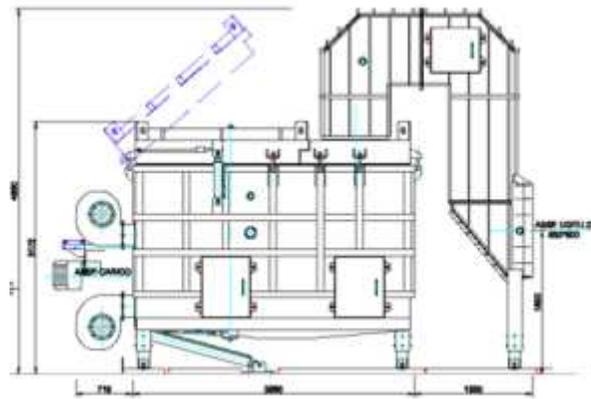


Herbal Crops®



The Plant: Eco-DCM[®]

Eco-DCM[®] is a burning system (moving or fixed grid with rotating blade, depending on the application and fuel) able to develop and convey thermal energy from solid fuels. Eco-DCM[®] feeding is ensured by a lung, able to ensure adequate autonomy. Its shape and design allows to achieve and maintain operating temperatures of 900÷1100 °C, thus allowing to achieve extremely low values of gaseous emissions.



Energy production

The plant can be custom designed to the specific needs for the production of:

- Water or hot air for farm uses (heating/cooling of breeding and other environments);
- Electricity for internal use or for sale to the electricity network;
- Simultaneous electricity and heat (cogeneration).



Depending on requirements, suitable turbines and/or heat exchangers for heat recovery are associated with the Eco-DCM[®] combustor.

The energy production systems based on power required by the customer can be: air turbine (type EFGT), organic fluid turbo-generator (ORC type), or steam turbine.

Examples of farm use of energy

- Powered hot water heaters.
- Ventilation tunnel supplied with hot or cold air.
- Heat exchanger for air/water heaters.
- Electric ventilation systems.

On Client's request the AVI Power® package may also include design and installation of heat transfer and heat distribution systems.



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